

PCT

30 SEP 2004

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

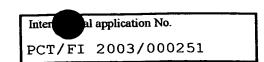
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION See Form PCT/IPEA/416									
BP105724		The state of the s								
International application No.	International filing date (day/mon									
PCT/FI 2003/000251	01.04.2003	02.04.2002								
International Patent Classification (IPC) or national classification and IPC										
C01G 23/053, B01J 21/06										
Applicant										
KEMIRA PIGMENTS OY et al										
This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.										
2. This REPORT consists of a total of 5 sheets, including this cover sheet.										
3. This report is also accompanied by ANNEXES, comprising:										
a. (sent to the applican	t and to the International Bureau) e	total of 2 sheets, as follows:								
5 - 1 - 1 - 4 - of the	description claims and/or drawing	s which have been amended and are the basis of the	nis report							
sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the										
ما الما الما الما الما الما الما الما ا	ve Instructions).	this Authority considers contain an amendment t	hat goes							
sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the										
Supplementa			ŀ							
b. (sent to the Internati	ional Bureau only) a total of (indica	te type and number of electronic carrier(s))								
containing a sequence listing and/or tables related thereto, in computer										
readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).										
4. This report contains indications	relating to the following items:		l							
	of the report									
Box No. II Priori	ty .									
	stablishment of opinion with regard	l to novelty, inventive step and industrial applicat	ility							
I []										
Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial										
applicability, citations and explanations supporting such statement Box No. VI Certain documents cited										
	La									
Box No. VII Certain defects in the international application Box No. VIII Certain observations on the international application										
BOX 140. VIII GGI										
Date of submission of the demand	Date	f completion of this report								
20.10.2003	30.	06.2004								
Name and mailing address of the IPEA	SE Autho	rized officer								
Patent- och registreringsverke		•								
Box 5055 S-102 42 STOCKHOLM	Jen	s Waltin/MP								
Facilità No. 146 9 667 72 88	Telen	hone No. +46 8 782 25 00								

Facsimile No. +46 8 667 72 88
Form PCT/IPEA/409 (cover sheet) (January 2004)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY



Box	No. I	Ва	sis of the report				
1.	With	vise indi	o the language, this report is based on the international application in the language in which it was filed, unless cated under this item.				
	This report is based on a translation from the original language into the following language which is the language of a translation furnished for the purposes of:						
		international search (under Rules 12.3 and 23.1(b))					
		Ħ	publication of the international application (under Rule 12.4)				
		Ħ	international preliminary examination (under Rules 55.2 and/or 55.3)				
2.	With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):						
			ternational application as originally filed/furnished				
	\boxtimes		escription: as originally filed/furnished				
		pages	received by this Authority on				
		pages pages					
		the cl					
			as originally filed/furnished				
		pages pages	as amended (together with any statement) under Article 19				
			received by this Authority on 20.10.2003				
		pages	1 1 - 41 - Anthonity on				
		the d	rawings:				
		page	s as originally filed/furnished				
		page	1 1 4b :- A 4b try on				
		page	5				
l		a seq	quence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.				
3.		The	amendments have resulted in the cancellation of:				
			the description, pages				
			the claims, Nos.				
	the drawings, sheets/figs						
	the sequence listing (specify):						
			any table(s) related to the sequence listing (specify):				
4	. [mad	s report has been established as if (some of) the amendments annexed to this report and listed below had not been the since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 2(c)).				
			the description, pages				
			the claims, Nos.				
			the drawings, sheets/figs				
		F	the sequence listing (specify):				
			any table(s) related to the sequence listing (specify):				
	• If i	tem 4 ap	oplies, some or all of those sheets may be marked "superseded."				
1							

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

Internal application No.
PCT/FI 2003/000251

Box No. V Reasoned statement uncitations and explanate	nder Article : ions supporti	35(2) with regard to novelty, inventive step or industrial applicabi ing such statement	ility;
1. Statement			
Novelty (N)	Claims Claims	1-15	YES NO
Inventive step (IS)	Claims Claims	1-15	YES NO
Industrial applicability (IA)	Claims Claims	1-15	YES NO

2. Citations and explanations (Rule 70.7)

Most relevant documents cited in the International Search Report:

D1: EP 0 675 086 A2

D2: Suzuko Yamazaki et al: "Effect of sulphate ions for sol-

gel synthesis of titania photocatalyst", Applied Catalysis A:

General, Vol 2, 2001, pp 97-102.

D3: WO 99/43616

D4: Database WPI, AN 1998-524530 & JP 10230169

D5: EP 0924 164 A2

METHOD CLAIMS 1-9:

D1 discloses a process for producing particles of titanium oxide for use as photocatalysts. According to example 3 in D1 (page 8-9), a solution of titanyl sulphate, i.e. titanium oxysulphate, was hydrolysed at 85 °C. The hydrolysis product was filtered and washed to obtain a wet cake, which was dried in order to obtain anastase-type titanium oxide fine particle powders. Thereafter, the particles were subjected to thermal and hydrothermal treatments. It is further mentioned in D1 that a seed may be present in the solution of titanyl sulphate (page 3, lines 55-57), and that the titanium oxide fine particles may be various titanium oxides, e.g. hydrous titanium oxide (page 3, lines 22-24).

Thus, the main difference between the process according to present claim 1 and the process according to D1 is that the product of the process according to claim 1 has a sulphur content of 1-5%. According to the description, the observed high catalytic activity of the product is related to the

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient. Continuation of: $Box\ V$

sulphur content. D1 does not recognise a relation between sulphur content and catalytic activity. The sulphur content is not even mentioned in D1. Further, the prior art found during the search reveals no ${\rm TiO_2}$ photocatalyst produced by a sulphate process with a sulphur content between 1-5%. The sulphur content of commercial titanium dioxide is 0.3-1.0 %, according to D3 (table 9).

Thus, there is no indications in the prior art, that would lead a skilled man towards the invention as defined in claim

Accordingly, the invention according to claim 1 and dependent claims 2-9 is novel and considered to involve an inventive step.

PRODUCT CLAIMS 10-12:

D2 (refer to abstract, table 1 and fig.2) discloses a TiO_2 photocatalyst with an S-content of 1.52 and 2.74 wt% and specific surface area of 138, 204 and 241 m²/g, which is prepared by peptization of titanium alkoxide in nitric acid, dialysis, concentration of the obtained sol to gel, drying and firing, i.e. a process different from the modified sulphate process disclosed in the present application.

Thus, the photocatalyst according to present claim 10 differs from those disclosed in D2 by the production method. The production method according to the present application can be expected to impart distinctive characteristics on the final product in relation to D2, in terms of photocatalytic activity.

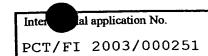
Therefore, the subject matter of claim 10 and dependent claims 11-12 is considered novel and inventive over D2 (cf PCT Guidelines 5.26-5.27).

D3 (refer to page 3, lines 10-26 and tables 7 and 9) discloses TiO_2 with a specific surface area of up to 240 m²/g and sulfphur content of 0.04 - 0.24 wt% (or 0.12 - 0.72 calculated as SO_4^{2-}), which is prepared by the sulphate process.

D4 discloses photocatalyst powder which contains fine titanium

.../...

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY



Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

dioxide particles with specific surface areas of 130-350 m²/g, prepared by the sulphate process. D4 is silent about the sulphur content, but it may be assumed that the sulphur content is about 0.3 - 1.0 wt%, since according to D3, the sulphur content of commercial TiO₂ is 0.3-1.0 wt%.

The photocatalyst according to present claim 10 differs from those disclosed in D3-D4 by the sulphur content, which, as mentioned above, is related to the observed high catalytic activity.

Therefore, the invention according to claims 10-12 is novel and considered inventive also over D3 and D4.

It may be noted that since claims 1 and 10 are considered inventive, D5, which relates to doping of titania catalysts with chromium or iron ions in order to obtain catalysts utilizable in visible light range (cf present claims 7-9 and 12), is no longer considered relevant.

USE CLAIMS 13-15:

The invention according to claims 13-15 is considered to fulfil the novelty and inventive step criteria, since the invention according to claims 1-12 do.

Finally, the claimed invention is considered to be industrially applicable.